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## ON A NEW VARIETY OF CHRYSOCOLLA FROM CHILE.

By HARRY F. KELLER.

(*Read April 23, 1909.*)

Like other cryptocrystalline or amorphous minerals the hydrated silicates of copper collectively designated as chrysocolla vary considerably in their chemical composition. They also show very marked differences in color, some of the varieties being deep green, while others exhibit various shades of bluish-green and blue. In many instances the color of the mineral is doubtless modified by the presence of admixtures, such as the oxides of iron, manganese or copper, but we can hardly account for the existence of both the decidedly green and the pure blue modifications without assuming that they are different in composition. Thus in the case of the hydrated carbonates of copper, malachite and azurite, the difference in color is known to be due to a difference in the proportions of chemically combined water.

Now the analyses of certain green varieties of chrysocolla closely approach the composition  $\text{CuSiO}_3 + 2\text{H}_2\text{O}$ , but those of other occurrences, and particularly of the blue varieties, have yielded not only different proportions of silica, oxide of copper and water, but also notable quantities of other constituents, like alumina and phosphoric acid. Among several Chilean chrysocollas of which specimens were presented to me by my brother, Mr. Hermann A. Keller, there is one which appears to me of peculiar interest as its analysis may throw some light on the constitution of the blue varieties of the mineral. It was found at Huiquintipa in the Province of Tarapacá, and is in the form of turquoise-blue, enamel-like crusts, disseminated through a honeycombed silicious matrix. It is brittle with a hardness of 3.5. The powder is of a pale greenish color. When heated in the closed tube, the mineral gives off considerable moisture and blackens, and it is readily decomposed by the mineral acids, without gelatinizing.

The analyses yielded :

	I. Per Cent.	II. Per Cent.	Calculated for $\text{CuH}_2(\text{SiO}_3)_2 + x\text{H}_2\text{O}$ Per Cent.
Specific gravity.....	2.532		
$\text{SiO}_2$ .....	46.14	45.89	47.31
$\text{CuO}$ .....	28.85	28.69	31.39
$\text{Al}_2\text{O}_3$ .....	.58	.47	
$\text{FeO}$ .....	1.38	1.33	
$\text{CaO}$ .....	1.64	1.67	
$\text{MgO}$ .....	.83	1.01	
$\text{H}_2\text{O}$ .....	20.15	20.32	21.30
	99.54	99.38	100.00

It was found, as a mean of several closely agreeing determinations, that two thirds of the water (13.41 per cent.) escapes below  $125^\circ \text{C}$ ., while the remainder (6.83 per cent.) can be expelled only by protracted ignition at a red heat. There can be no doubt, then, that the latter portion is present in the substance as part of an acid salt, as in diopase for example. Assuming that the other two thirds of the water is simply "water of crystallization" and, further, that the small amounts of iron, calcium, magnesium, etc., are admixtures, the formula calculated from the above analytical data is  $\text{CuH}_2(\text{SiO}_3)_2 + \text{H}_2\text{O}$ . This differs from the composition generally assigned to chrysocolla in that it shows the Chilean mineral to be an acid metasilicate of copper. I venture to express the belief that a careful reëxamination of other blue chrysocollas may lead to similar results.

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